DOCUMENT RESUME

ED 242 127 EC 161 897

AUTHOR Bauer, Dan
TITLE Aerobic Fitness for the Moderately Retarded.
INSTITUTION American Alliance for Health, Physical Education, Recreation and Dance, Reston, Va. Information and Research Utilization Center.
PUB DATE Nov 81
NOTE 33p.
AVAILABLE FROM American Alliance for Health, Physical Education, Recreation and Dance, 1900 Association Dr., Reston, VA 22091 ($2.25, Stock No. 245-27004).
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052) -- Collected Works - Serials (022)
JOURNAL CIT Practical Pointers; v5 n5 Nov 1981

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Adapted Physical Education; *Aerobics; Athletics; Elementary Secondary Education; *Games; *Moderate Mental Retardation; Motor Development; *Physical Activities; *Physical Education; *Physical Fitness; Teaching Methods

ABSTRACT

Intended for physical education teachers, the booklet offers ideas for incorporating aerobic conditioning into programs for moderately mentally retarded students. An explanation of aerobic fitness and its benefits is followed by information on initiating a fitness program with evaluation of height, weight, body fat, resting heart rate, and cardiovascular fitness. Following screening, a plan should be established regarding the frequency, duration, and intensity of exercise. Teaching principles should include avoidance of too much exercise, use of the overload principle, provision for progression, and adequate record keeping. Group and individual activities and games (running, walking, jumping rope, roller skating, stationary bike riding, obstacle course relays, relay races, and line games) designed to increase aerobic fitness are described along with teaching suggestions for each. Additional activities of dance and swimming are considered. (CL)

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November, 1981
Volume 5, Number 5

AEROBIC FITNESS FOR THE MODERATELY RETARDED

Dan Bauer

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Stock Number: 245-27004

EC161897

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ACKNOWLEDGEMENTS

As each day passes more research and more people are proving the physiological and psychological benefits of fitness activities. Within the past 5 years, spas, fitness clinics, and aerobic centers have multiplied at an incredible rate. Corporations are now giving financial incentives for employers; health insurance companies are lowering rates for these corporations and the employees are living longer, healthier, and more productive lives.

In this Practical Pointer, Dan Bauer, follows the same easy to understand program ideas as in Practical Pointer Volume 5, Number 4, Aerobic Fitness for the Severely and Profoundly Mentally Retarded. Mr. Bauer offers innovative ideas to incorporate aerobic conditioning into basic physical education instruction. With his guidance, instructors and parents can reinforce the benefits of fitness at an early age.

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INTRODUCTION

The intelligence quotient of the moderately retarded child is in the 36-52 IQ range. In programming physical education activities for the moderately retarded, social or mental age is more important than chronological age. Social age is determined by adaptive behavior. Two of the most commonly used tests to determine levels of adaptive behavior are the Vineland Social Maturity Scale and Adaptive Behavior Scales.

The general characteristics of the moderately retarded student have been identified as follows:

- is capable of eventually learning self-care in dressing, undressing, eating, toileting, keeping clean, and in other necessary skills which will establish independence of parents in a living routine;
- is capable of learning to get along in the family and in the immediate neighborhood by learning to share, to respect property rights, and in general to cooperate with family or neighbors;
- is capable of learning to give supervised assistance in chores around the house or in a routine task for some remuneration in a sheltered environment;
- has a rate of mental development one-quarter to one-half that of the average child;
- is not capable of learning academic skills such as reading and arithmetic beyond the rote learning of some words or simple numbers;
- has speech and language skills which are distinctly limited;
- can eventually learn to protect himself from common dangers;
- will require some care, supervision, and economic support throughout life.[1]

The teacher of the moderately retarded can expect to find some students who will manifest some form of physical impairment. Such impairment may include an orthopedic handicap, cerebral palsy, epilepsy, mild-to-severe handicaps with regard to locomotion and general motor coordination, and in some cases sensory impairments, which may include quite severe sensory-motor deficiencies.

FITNESS NEEDS OF THE MODERATELY RETARDED

A widely-held belief is that the mentally retarded can benefit from a planned physical activity program. Studies by Julian Stein have shown that physical fitness and motor development of the mentally retarded do not need

to be adversely affected by slower mental development. The fact that motor development is affected in many instances is probably not so much a primary effect of the retardation but a secondary effect caused by limited opportunities for instruction and participation. When the level of activity declines, fitness also declines, and if the individual has limited opportunity for instruction and participation in games, then specific coordinations will not normally develop. Thus, a vicious cycle is set into motion: the lack of endurance and skill puts the child at a disadvantage and for those reasons alone, may not be accepted in the active games being played by peers.[2]

While there are few laboratory studies of fitness among different handicapped groups, a growing body of research substantiates the low cardiovascular fitness of handicapped persons. This coupled with other high risk factors such as obesity, physical inactivity, poor nutrition, fear of failure, and medication, make many handicapped individuals prime candidates for heart disease.[3]

The physical educator is challenged to provide a comprehensive instructional program which will permit exposure, improvement, and success in levels of motor performance and physical fitness. The following material will deal with one area of the total physical education program, aerobic fitness. The goal of the aerobic fitness program is to develop, improve, and enhance the aerobic fitness of the moderately retarded through a varied program of conditioning and play activities.

AEROBIC FITNESS BENEFITS

Aerobic fitness consists of the ability of the heart, blood, and blood vessels to transport oxygen to the muscle cells, process the oxygen in those cells, and carry off the resultant waste products. Many physiologists feel that this is the most important component of physical fitness. A high level of aerobic fitness is needed to handle many daily tasks and to cope with the unexpected without placing dangerous stress on the body.

With a high degree of aerobic fitness, fatigue is postponed and work can be carried on for longer periods. In medical terms this translates into the following benefits:

- the heart beats slower--a decrease in both the exercise pulse rate and the resting pulse rate;
- the heart beats more forcefully--more blood is pumped out with each heartbeat;
- there is improved vital capacity--the lungs can hold more air;
- wind is better--less breathing exertion with a given level of performance and for a longer period of sustained effort;
- there is more endurance--the individual can tolerate robust action longer;
- there is less blood pressure rise with exercise;

. There is more energy--the ability to take up more oxygen and turn it into mechanical work;

. play or hard work isn't as fatiguing--the exertion of play requires a lower percentage of maximum effort, with faster recovery and less fatigue.

The best exercises for improving aerobic fitness are walking, jogging, swimming, dancing, bicycling, jumping rope, and any other activities that are of a continuous dynamic nature involving the large muscle groups of the body.

WHERE TO START

To meet specific needs in designing an aerobic fitness program it is important to develop screening devices to evaluate the individual. The best time to screen the students is when the fall semester begins or when new students enter school. The purposes of screening are: to establish pupils' strengths and weaknesses; to plan an individualized program; to enable the teacher to keep accurate records of progress.

To evaluate the pupil when beginning the aerobic fitness program the teacher can use the following devices:

1. Examination of school health records by the nurse to establish any restrictions that would limit the child or prevent him from participating in a fitness program.

2. Recording the height and weight of the student.

   A. Height--the height of the student will help to give a picture of the body type and will help to determine the ideal weight of the student.

   B. Weight--as a starting point toward body conditioning, the first step is nearly always to know the student's weight. Body weight, especially overweight, is the largest indication of whether some sort of conditioning program is necessary.

3. Evaluating body fat. This measurement is important because there are so many variables, e.g., height, sex, and body types, associated with overweight that it is often impossible to determine if a person is overweight just from using a height weight table. According to Astrand,

> There are graphs and tables available usually based on height and sex, giving the so-called ideal body weight. One of the better known of these norms is the Metropolitan Life Insurance Table (1963). Such norms are, however, rather inaccurate and only meant as a general guide. Thus the need for a relatively simple but meaningful method of assessing body composition, including the amount of adipose tissue is apparent.[4]

A practical method of recording body fat is the caliper measurement of skinfold thickness. The National Center of Health Statistics in Washington points out that,

> Skin folds permit a closer estimate of body fat than do the tables of relative weight... Skin folds are becoming established as the easiest and most direct measure of body fat available in the doctor's office, the clinic, or in a large scale population survey.[5]

In most of the population under fifty, at least half of the body fat is stored directly underneath the skin. By measuring the thickness of the fold produced when the skin and tissue just under it are firmly grasped, the physical educator can get a good idea of how much fat is present. Some of the most common locations at which this measurement is taken includes the upper arm at the triceps (back of upper arm), the subscapular region (middle of the back at the shoulder blades), the waistline, the biceps (front of the upper arm), and the ilium (waistline right above the hipbone), to mention a few. Skinfold thicknesses illustrating obesity are listed in Table 1.

Table 1. Minimum triceps skinfold thickness indicating obesity inches (millimeters).[6]

Age (Years)	Males	Females
5	0.4724 (12)	0.55118 (14)
6	0.4724 (12)	0.59055 (15)
7	0.5118 (13)	0.62992 (16)
8	0.55118 (14)	0.66929 (17)
9	0.59055 (15)	0.70866 (18)
10	0.62992 (16)	0.78740 (20)
11	0.66929 (17)	0.82677 (21)
12	0.70866 (18)	0.86614 (22)
13	0.70866 (18)	0.90551 (23)
14	0.66926 (17)	0.90551 (23)
15	0.62992 (16)	0.94455 (24)
16	0.59055 (15)	0.98425 (25)
17	0.55118 (14)	1.02362 (26)
18	0.59055 (15)	1.06299 (27)
19	0.59055 (15)	1.06299 (27)
20	0.62992 (16)	1.10236 (28)
21	0.66929 (17)	1.10236 (28)
22	0.70866 (18)	1.10236 (28)
23	0.70866 (18)	1.10236 (28)
24	0.74803 (19)	1.10236 (28)
25	0.7874 (20)	1.14173 (29)
26	0.7874 (20)	1.14173 (29)
27	0.82677 (21)	1.14173 (29)
28	0.86614 (22)	1.14173 (29)
29	0.86614 (22)	1.14173 (29)
30-50	0.90551 (23)	1.1811 (30)

4. Recording the resting heart rate. To plan an exercise program it is necessary to know the student's resting heart rate. The resting heart rate can be recorded after the student has been in a sitting position for 5 or more minutes.

   There are many variables in heart rates. The heart rate can be affected by age, body position, food intake, time of day, emotions, and physical activity. The resting pulse rates of highly trained athletes may be 20 or even 30 beats slower than the pulse rate of persons not in training. The average pulse rate of young men, lying at rest before eating is 64 beats/minute, with a range from 38-110 beats/minute.[7]

   Regular vigorous exercise increases the strength, endurance, and efficiency of the heart. A fit heart pumps 25% more blood/minute when at rest and 51.3% more blood/minute during vigorous exercise than an unfit heart. A fit person's heart beats 60-70 times/minute (86,400-100,800 beats per day); an unfit person's heart beats 80-100 times/minute (115,200-144,000 beats/day).[8] The heart of a fit person is obviously more efficient than that of an unfit person and is therefore less subject to fatigue and strain.

   Henry concluded that a decrease in heart rate is an effective measure of changes in athletic conditioning and that the resting pulse rate has validity as an indirect indication of condition.[9] One of the goals of the aerobic fitness program is to lower the resting heart rate of the students in the program. By charting resting heart rates the teacher can determine if the exercise program is being effective and if the individual is becoming more fit.

5. Measuring the student's present level of fitness with a field estimate of cardiovascular efficiency. A field test of running (300-yd., 600-yd., etc.) is easy to administer and does not require expensive and elaborate laboratory equipment such as treadmills, bicycle ligometers, and apparatus for determining concentrations of oxygen and carbon dioxide in expired air. Rather, only a stopwatch and a running area marked off in distance segments is required.

   The most widely-used field tests of fitness for the moderately retarded are those developed by Hayden - 300 yards - (1964), AAHPER/Kennedy Foundation - 300-yard run-walk - (1968), and Fait - 300-yard run-walk - (1966). All these tests come with established norms.

   For the educator who wishes to scientifically plan an exercise program based on heart rates a modification of Cooper's 12-Minute Test can be used.

The basic idea here is to record the student's resting heart rate before the test and then have the student walk, run, or walk-run for 12 minutes and record the distance covered and the exercise heart rate.

Student's sample test scores may look like this:

STUDENT	HEIGHT	WEIGHT	AGE	RESTING PULSE	EXERCISE PULSE	DISTANCE COVERED
1. T.B.	6'0"	150	21	72	170	1.2 mi.
2. K.S.	5'2"	130	17	80	130	.5 mi.

By recording the distance covered, resting and exercise pulse rates during each student's test, a present level of fitness can be obtained.

Numerous studies have shown that conditioning programs improve scores on cardiovascular fitness tests. This improvement has been in the form of lowered pulse rates, higher resting stroke volumes, and increased resting cardiac output. Among the studies reporting such findings have been Holloszy, Henry, and Faulkner.[10] By noting improvements in distance covered, resting or exercise pulse rates, the educator can determine if the student is becoming better conditioned on the 12-minute test. By giving the 300-yard and 12-minute tests at intervals during the year the educator can use the data to: determine the present fitness level of the student; determine the progress of the student; motivate and challenge the students to improve the performance level.

A word of caution in use of the 12-minute test. The test may require vigorous effort for which the individual may not be prepared. It is wise to use the test only after the student has been conditioned for a period of time with endurance activities. Cooper strongly recommends that medical clearance be secured and that sedentary men over 30 complete a basic walking-running program for 6 weeks before they take the test.

FREQUENCY, DURATION, AND INTENSITY OF EXERCISE

After the pupils have been screened, the teacher should determine the frequency, duration, and intensity of exercise necessary to improve cardiovascular endurance in each pupil. These variables will vary according to age, weight, and the general fitness level of the student.

Frequency usually refers to the number of exercise sessions a week. A student with low endurance may need short exercise periods everyday. The student with high levels of fitness can be scheduled for longer, less frequent exercise sessions.

Duration refers to the length of the exercise session. The activity can be continuous, e.g., 30-60 minutes of roller skating, walking, or bike riding. The exercise session can also be intermittent as with interval training, which consists of work followed by rest for a set time period, both repeated for several bouts.

INTENSITY OF EXERCISE

In the past, exercise was measured in time, distance, physical load, or number of performed actions. The physical education teacher today may still use all these measurements to good benefit. However, while using these

measurements, there is no way to measure one important missing element: effort or intensity. Many exercise programs are conservative in starting point and rate of progression in order to avoid risk for the unfit student. Teachers may not know when to increase the activity levels so that maximum fitness is attained.

By using heart rate measurements, the teacher can determine the type of conditioning effect the student is receiving from the activity. For too long physical education teachers or others have assumed that physical activities automatically develop endurance. Thus, two laps around the field or two laps around the gym or three minutes of calisthenics at the beginning of class seldom have the anticipated effect.

The teacher can use the heart as a kind of computer to determine how much activity or intensity is required for training results. By exercising at a specific heart rate the student can maintain a constant level of effort. (Fatigue, heat, sickness, and other conditions are automatically accounted for in that at such times less effort is needed to raise the heart rate to a given level.)

Each individual has an amount (intensity) of exercise which will be enough to condition the muscles and cardiovascular system, but at the same time will not be overly strenuous. That is to say, there is a target zone in which there will be enough activity to achieve fitness, but not too much to exceed safe limits. The important principle in aerobic fitness is to find each person's target zone.

The term "target zone" is used to describe the amount of activity which is safe enough to achieve fitness but not too much to exceed safe limits. This target zone is the level of activity which produces a heart rate of from 70-85% of the maximum attainable during an all-out effort.

The formula for determining the target zone is the subtraction of the student's age from the maximal attainable heart rate of 220. The average 20-year old has a maximum heart rate of 200. From the maximum heart rate take 70% (140 beats/minute) to 85% (170 beats/minute).

Example: A 15-year old student has a maximal heart rate of 205 (220 minus 15 age). Seventy to eighty-five percent of 205 is a target zone of 144 beats/minute to 174 beats/minute.

From the example given it can be seen that there is a relationship between age and the highest heart rate which can be reached in an all-out effort. The older one gets, the lower the maximal aerobic power and the maximal attainable heart rate. This relationship can be seen from Table 2.

Using the target zone, the teacher can determine the type of conditioning effect the student is receiving. A student's heart rate at the 70% level for 20-30 minutes should be sufficient to promote aerobic fitness. Although not necessary, the 85% level provides an upper limit which may be sustained if a more intense workout is desired.

By monitoring pulse rates the teacher can determine which activities

Table 2. Maximal heart rates: ages 4-33[11]

SEX	AGE GROUPS						
	4-6	7-9	10-11	12-13	14-15	16-18 16-17	20-33 20-25
Number of subjects M	10	12	13	19	10	9	42
Number of subjects F	7	14	13	13	11	10	44
Max. heart rate* M	203±2.2 7.0	208±2.4 8.4	211±2.3 8.1	205±4.1 17.7	203±4.1 12.8	202±3.1 9.2	194±1.6 10.3
Max. heart rate* F	204±5.0 13.2	211±2.0 7.5	209±2.5 8.8	207±2.8 10.3	202±2.0 6.6	206±2.5 7.7	198±1.5 9.9

*Numbers represent mean, standard error of the mean and standard deviation

are elevating the pulse into the target zone and promoting aerobic fitness. If the pulse rate isn't being raised into the target zone, new activities may have to be substituted or the length or intensity of the activity may have to be increased. By the same token if the heart rate is too high and above the target zone the activity will have to made less frequent or the intensity lessened.

THE ORGANIZATION OF THE AEROBIC FITNESS PROGRAM

One of the greatest services an Adapted Physical Education teacher or any physical educator for that matter, can render to a community is to care for the physical fitness of children. In addition to maintaining the fitness of the students, the teacher should seek to identify the sub-fit child, to determine the causes of low fitness, and ameliorate them by designing an individualized exercise program for each child. The teacher can use a modification of Clarke's Case Study approach as a guide for designing and implementing a fitness program to meet the individual needs of the students.[12]

The procedures used by Clarke for improving the fitness levels of students below accepted standards are more than just theory. Clarke's procedures have evolved through use in over a third of a century in school and college physical education programs. Following are some suggested steps:

1. Have the students be given an adequate health checkup. This is the proper starting point of any physical fitness program. The physical examination by a medical doctor should establish the activity tolerance level and the type of activities for which the student can benefit.

2. Select those who are below predetermined standards of strength, stamina,

and other basic physical fitness elements through the administration of valid tests available to the physical educator.

3. For the students who are sub-fit, conduct physical activities selected to improve their condition. For example, obese students can begin a walking program; a blind student can ride a stationary exercise bike.

4. After six weeks, review individual programs to determine those students who are making progress and to identify those who are not responding favorably to exercise. For those students who are improving at a satisfactory rate, the exercise program can be continued with progressive dosage. For those students making little or no progress, their individual program may have been poorly conceived and may have to be altered or changed completely. Repeat reviews of the student's programs at intervals of about six weeks in order to continue checking on the progress made by each sub-fit child. This will entail chart and record-keeping by the instructor.

PRINCIPLES OF EXERCISE TO USE IN TEACHING FOR FITNESS

The following principles of exercise may be used as a guide in the preparation of exercise programs:

1. Exercise should be adapted to each student's exercise tolerance. Too much exercise may be harmful.

   A. Watch for fatigue or undue discomfort in the students while they are exercising.

   B. The presence of exhaustion and slow recuperation, and coughing, indicate that exercises are too severe.

   C. With unfit groups, exercise tolerance will be low at the start, but should gradually rise.

2. The principle of "overloading" should be applied to induce a higher level of performance.

   A. The "overload" principle states that increases in muscular strength and aerobic fitness result from an increase in the intensity of work performed in a given unit of time. The intensity of work can be progressively increased in the following ways:

      1) Increase the number of repetitions, sets, or types of exercise performed. Send the students through an obstacle course six, seven, or more times in a 30-minute period instead of three or four times.

      2) Increase the distance covered. As the student's tolerance for exercise increases, through faster times or lowered exercise pulse rates, increase the distance covered.

3) Decrease the rest interval between active sessions.

3. The exercise plan should provide for progression. Without progression there will not be an increase in fitness. The same amount of exercise faithfully executed each day will contribute to the maintenance of whatever aerobic fitness already exists, but it will not improve fitness.

4. Physical development should be charted and recorded at set times.

   A. Keep individual records.

   B. Take student height, weight, and percent of body fat at intervals.

   C. Watch for large weight gains, weight loss, etc.

AEROBIC FITNESS ACTIVITIES AND GAMES FOR THE MODERATELY RETARDED

Meeting the needs of the retarded student for aerobic fitness is not simple. Many of the students will voluntarily participate; others if left alone, will sit and do nothing. Motivation is necessary to make the student want to participate. Participation in the activities should be encouraged, but there should be no resort to pressure tactics. The mentally retarded student needs and seeks approval, and can often be led to cooperate and participate if he/she knows that this is what the teacher desires and approves.

The mentally retarded are a very heterogenous group. Among the moderately retarded there will be many different skills and motivational levels. Many different techniques of instruction may be necessary to solicit a desired response.

Those who develop programs for the moderately retarded should remember that social or mental age is more important than chronological age. At the lower level of mental ability or social age the moderately retarded child may show little interest in play. However, those with high levels of intelligence or social behavior can participate in group activities and games if slowly and carefully taught.

What follows is a discussion of individual and group activities and games that can be used to increase the aerobic fitness levels of the moderately retarded student.

WALKING

In their book, Creative Walking for Physical Fitness, Harry Johnson, M.D., and Ralph Bass stated that walking is perfect for achieving physical fitness. According to Dr. Johnson, walking is beneficial to cardiovascular health, weight control, figure control, mental activity, and overall health.[13]

The YMCA walking program recommends a ten-week conditioning program of

walking that gradually increases distance covered and pace walked. The ultimate objective of the YMCA program is sufficient fitness to walk two miles in thirty minutes. At this pace the walker's energy expenditure will increase four to six times the basal metabolic rate.[14]

Walking is an excellent activity for the mentally retarded. Walking can be done at school, at home, or in the neighborhood, and is helpful in building endurance and weight control. According to Astrand,

> It is particularly important to stimulate young individuals to regular physical activity, for such activity will in the long run effectively counteract obesity by keeping the individual within the range where spontaneous caloric intake is properly regulated by the caloric output. The amount of work (e.g., distance moved) is more important for the caloric expenditure than the intensity of work. Walking about 2 miles a day during a 10-year period demands an amount of energy contained in about 180 lbs. of adipose tissue.[15]

In initiating a walking program with the moderately retarded it is important to begin the walking program at each student's tolerance level and attempt to build upward from that point using the overload principle. Some obese and poorly conditioned students may only be able to walk 220-440 yards when first beginning the program.

Cooper recommends the following walking exercise program for people just beginning to exercise:

Table 3. Walking exercise program[16]

Week	Distance (Miles)	Time (min.)	Freq/Week
1	1.0	15:00	5
2	1.0	14:00	5
3	1.0	13:45	5
4	1.5	21:30	5
5	1.5	21:00	5
6	1.5	20:30	5

Teaching Suggestions

1. Record distance covered or time walked by each student and gradually try to increase that amount. A good goal is to have the student walk at least two miles a day.

2. Set up a small circuit, track, or designated course for the students

to walk on. Measure the distance of the course so distance walked can be charted.

3. Have the students walk clockwise or counterclockwise around the marked course or track. The goal is to have students walk around the course on their own without assistance.

4. Use food or other motivational rewards to motivate the students to walk and stay on course.

5. Praise should gradually take the place of food rewards.

6. Encourage parents to set up walking programs at home for the students during vacations or summer breaks.

RUNNING

Running and walk-running is an effective and easy way of developing aerobic fitness. In this activity, as well as walking, distance and duration can be regulated to the specific fitness status of the individual student. Progression can be planned for as needed.

Students in poor condition and the obese should begin with a walking program. Running should be postponed until they have obtained a fair level of fitness by walking. It is probably wise to keep any student more than 40 pounds over his ideal body weight on a walking program and forgo running.

Three types of running methods can be used with the moderately retarded. The first is the run-walk method, which is usually employed during the early phases of the running program. Using this method the sutdent can cover a selected distance by a combination of running and walking. The teacher can pull, push, or let the student run until they fatigue, and then let them walk until they or the teacher feel they are ready to run again. Progression is accomplished by having the child eliminate as much of the walking as possible while maintaining the selected distance.

A second method is to have the student run all the way over a set distance. The teacher may want to start with 110 or 220 yards and progress upward to longer distances such as a half-mile or mile as the students become conditioned. It is important to carefully watch for signs of stress and fatigue among the students if this method is employed.

A third method is maintaining the pace but increasing the distance. This method will require the student to run or run-walk for a longer period of time thus bringing the overload principle into play.

Teaching Suggestions

1. At the beginning of the program some of the students may have to be pulled or pushed into running.

2. Food rewards can be used for motivation but they should gradually be substituted by praise and other types of rewards.

3. It is important to have a track or designated area for the students to run or run-walk on. This can be a sidewalk, gym area, or a field marked with rope or lines. The course should be designed so that each lap or circuit is a convenient unit. One hundred and ten yards seems to work well with the mentally retarded. By knowing the distance around the track the teacher can easily chart distance run or walked.

4. To add the needed structure it is probably best to always begin the running at the same end of the course or track and always have the students run in the same direction. Reward and praise those who stay on course.

5. Students with certain types of handicaps, such as cardiac abnormalities, asthma, and diabetes should run within stipulated medical limitations. Also, progression in running programs should be slow. The development of endurance is the result of a deep systematic capacity, which changes slowly in response to the demands put on it.

6. Distance run can be charted and motivation increased by giving out certificates or rewards for certain distances covered during the semester or year, e.g., for 10 miles run, 25 miles, 50 miles etc.

JUMPING ROPE

Jumping, or skipping rope, can be an easy exercise or an extremely demanding one. The ability to provide different intensities of exertion makes jumping rope a flexible and useful exercise. In addition, jump ropes are inexpensive, portable, and compact. Jump ropes can be used alone, or with other students, indoors or outside. Once proficiency is obtained, very little space for jumping is needed.

Rope jumping can be used to develop agility, balance, rhythm, and in particular, aerobic fitness.

The table below gives an idea of the energy cost of jumping rope.[17]

Table 4. Energy cost of jumping rope.

Number of Turns (per minute)	Calories Spent (per minute)
50-60	6.67
70-80	7.25
90-100	8.58
110-120	11.75
130-140	15.67

Not all of the moderately retarded will learn how to jump rope, but many can be taught this skill. As an introduction to jumping rope the teacher may want to use the following activity as an introduction.

For equipment a 15-25 foot rope is needed. Have two students hold either end of the rope and use the following progression:

1. Hold center of rope on the ground and move it s[illegible] back and forth on the ground while the student jumps over it as [illegible]ope moves along.

2. Increase the speed at which the students move th[illegible]ope along the ground so the student has to jump faster.

3. Have the children holding the rope swing it back and forth slightly above ground so the student has to jump over it.

4. Swing the rope back and forth in a slow circle while students jump over it.

5. See which student can jump over the rope 5 times in a row, 10, 20, etc.

Once the students have the idea of jumping over a swinging rope held by others the concept of jumping rope individually can be introduced. Teaching this concept may require time and much patience on the part of the teacher, but many of the moderately retarded will be able to learn this skill.

Teaching Suggestions

1. The rope must fit the student. The correct length should reach the armpits when held beneath the feet.

2. To learn jumping without the rope, have the student stand with forearms down and in rear of the ribs and hands 8-10 inches out from the hips. With both feet together, have him/her hop an inch or so off the floor, with a slight bend at the knees.

   Have the students do about 20 such bounces to get the rhythm and then have them make a forward circle of the hands by moving the wrists, pretending that they are turning a rope as they bounce off the floor.

3. Once the idea is grasped by the student, start the student working with the jump rope.

4. Start by having the student hold both ends or handles of the rope in one hand; have the student hold the rope at the side and swing the rope rhythmically in a circle to the side of himself/herself in time with the bounce. Explain or show that the rope should hit the floor when he/she is off the floor. Once the student can do this or grasp this concept, he/she should have no trouble passing the rope under the feet when airborne.

5. The student can be taught to put the rope behind him/her and as he/she

brings the rope forward say outloud, "turn and jump." This gives the student the idea of jumping as the rope comes forward. At the beginning level the student may bring the rope forward and forget to jump as the rope hits the feet. They should then step over the rope and bring the rope forward again, repeating out loud, "turn and jump." Eventually the student will get the idea to turn the rope forward and jump at about the time the rope passes near the feet.

6. Allow plenty of room for each child.

7. Avoid overfatigue; as the students practice they will be able to sustain the activity for a longer period.

8. Music, e.g., top ten tunes, disco, may help the student to enjoy the activity more.

9. Manual guidance as a method of instruction may be necessary with some children.

10. Rewards may be used as a means of motivation. They can take the form of two, or five-minute jump clubs--the student can get a shoulder patch, certificate, or candy award for making the club.

11. Demonstration can be an effective teaching device. Once students see the instructor jumping rope they may be able to mimic the skill.

ROLLER SKATING

Roller skating is a good activity for improving cardiovascular fitness. Since skating burns 295-350 calories (leisure skating) or 520 to 620 calories (vigorous skating) it can also play an important part in weight control.[18]

Roller skating is an activity in which most normal children have at some time participated. Skating can be enjoyed on the playground, sidewalk, alone, or at the local arena with friends or family. The moderately retarded child, who may be over-protected by his family, can learn the roller skating skill in physical education class, and practice it at home or around the neighborhood. Roller skating is a lifetime sport and can be enjoyed by individuals of all ages and skill levels.

While roller skating is a reasonably safe sport, safety rules and close supervision are necessary. Therefore, prior to beginning the roller skating unit the instructor may want to explain safety rules to the students. Some suggested safety rules are:

1. No pushing or shoving.

2. No touching other skaters.

3. Watch where you are going.

4. Let other skaters pass.

5. Slow down at corners.

6. If your skate comes off, go to the side of the skating area and put it back on.

Before any actual skating is attempted, students need to know how to put on and remove their own skates. This task may at first seem time-consuming, but its accomplishment in the long run will provide for more organized skating sessions. The instructor's time will be utilized in the skating lesson and not on putting on skates.

Teaching Suggestions

1. Problems will arise in starting a skating program and teaching the basics. Some methods to help the beginning skater can include:

   A. Provision of a carpeted area or mats so that those learning to skate will not fall on a hard surface. This also slows the skater down.

   B. Placing masking tape on the wheels can slow down those with balance problems.

   C. Provision of skate aids, chairs, or carts with wheels to give those learning, skate support.

   D. The teaching of fundamentals with the student having one skate on at a time.

   E. Beginning progressions with:

      1) Getting up safely from the floor with one skate on (right foot).

      2) Hanging on to a skate aid or chair with both hands for assistance in maintaining balance while shifting weight to the right skate and pushing with the left foot.

      3) Sliding forward on right skate while holding left foot off the ground.

      4) Skating on two skates with teacher aid, or a cart with wheels for support.

      5) Skating over the gym floor or area in a circle formation unaided.

2. As the students gain skill and confidence, game activities can be introduced. Some examples might include:

   A. Relays can use a number of combinations between teams (skating backwards, around obstacles, carrying a ball); the possibilities are numerous.

   B. Broom or floor hockey played on skates.

C. Dodge ball.

3. Many of the students will enjoy skating to music, e.g., top ten, disco, etc.

4. Certificates or rewards may be given to those students who may want to skate for distance, e.g., 10 miles, 50 miles, or 100 miles.

STATIONARY BIKE RIDING

Stationary bike riding can be used for those moderately retarded students who may need extra exercise or whose associated handicaps may make other aerobic activities difficult. Use the stationary bike for the mentally retarded blind students and for those who are so obese that walking is difficult or hard on legs or ankles.

Stationary bicycles are produced as expensive, calibrated models, either mechanically or electrically braked or as inexpensive uncalibrated models. The calibrated models have levels of resistance that read out in watts, KgM (kilogram meters), or KpM (Kilopond meters).

Good exercise bicycles have a calibrated resistance knob or level with definite settings on it. The settings consistently provide the same exercise challenge, so that, for example, if the bicycle is calibrated at 300 KgM for one day, it will hold that setting the following day, or for an even longer amount of time. Less adequate and expensive exercise bicycles have settings that are not reproducible and slip or have no numbers on the resistance knob at all, so that it is almost impossible to know if the student is exercising at the same KgM of resistance from day to day.

Teaching Suggestions

1. The bicycle should be fitted to the exerciser. The seat height should be adjusted correctly so that the leg muscles can function most efficiently. With the toe on the pedal, there should be a small bend at the knee when the pedal is in the fully down position and the seat is at the correct height.

2. Handle bars should be positioned so that the body is relaxed and leaning slightly forward, since hanging onto awkwardly placed handlebars alters the mode of exercise from isotonic to partly isometric.

3. Progression can be programmed by increasing the length of time of each exercise period, increasing the tension level of the braking device or resistance against which the student is working; gradually shortening rest pauses.

4. Motivation may be increased by letting the student exercise to music or in front of a television set watching an interesting program.

5. The mileage pedaled by each student can be recorded and awards or certificates handed out for riding 50, 100, or 200 miles, etc.

OBSTACLE COURSE RELAYS

Obstacle course relays provide a structured, challenging, and enjoyable activity for the mentally retarded. By shortening rest pauses, or by increasing the number of times the students race, aerobic fitness benefits are built into the obstacle course relay program.

An important characteristic of the obstacle course relay activity is its flexibility. The obstacle course may be adjusted in simplicity or complexity to any ability level. Students of various ages, handicaps, and skills can participate together. The obstacle course may be individually run, against one challenger, against the clock, or as a team activity. It seems that most of the younger children respond best to racing against the clock, challenger, or for a reward. The older and more capable students are more motivated by a competitive team relay.

The layout of the obstacle courses can take any form. One setup that seems to work well is to set up two courses with three to ten different stations which direct the students to the end of the field, gym, or gross motor area and back to a starting point. The two courses are set up with identical stations and are the same length. The obstacle course can include stations with activities that develop both fine and gross motor skills, so the students increase in skill and fitness. The number of races run each period can be increased or the obstacle courses can be made more difficult by adding new stations or tasks. The variety of tasks at the stations are limited only by the teacher's imagination and can include skills learned in P.E. class on other days of the week.

Teaching Suggestions

1. At the end of the class period, the teacher can give a reward, such as a small sucker, to each member of the winning team. This increases motivation.

2. Obstacle courses can be set up for wheelchair students as well as ambulatory students.

3. Roller skates can be worn during the relays to make the activity more challenging for more accomplished students.

4. Encourage the yelling and normal cheering the students make while performing. This adds to the team concept and is a good measure of enjoyment.

5. Relay teams should have few members (4-6). Students lose interest if they wait too long for a turn.

6. Introduce as few rules as necessary at first; introduce new rules in the relay situation.

7. A few positive signals or commands should be understood by all students, e.g., "go" to start and whistle to stop.

8. Spotters should be placed at stations of danger.

9. After some trial and error with different obstacle courses, a set course might be established and a record kept of student's times.

RELAY RACES

Relay races, if run with a short rest interval between races, can be excellent for building aerobic fitness. The basic idea is to alternate intervals of work (the relay race) and rest (waiting for a turn). As the year progresses, and the students become more fit, the students should be racing more and more, and resting (waiting turns) less and less.

Relay races can take various and numerous forms. For example, have races that have the students run, skip, hop, dribble a basketball, carry a ball, partner activities, retrieve a bean bag, knock down a pin, ride bikes, push scooter boards, moon buggies, mass balls, etc. Try to avoid complicated races or difficult activities that slow down the action. Remember to keep the teams small so that no student waits long for a turn.

THE LINE GAMES

There are a series of activities called line games which can be used with the moderately retarded students who can understand the basic concepts of games.

Described below are three line games: line soccer; line floor hockey; line basketball. The advantage of the line games is that the instructor can have as many students participating at a time as desired; even those on the sidelines can share in the action.

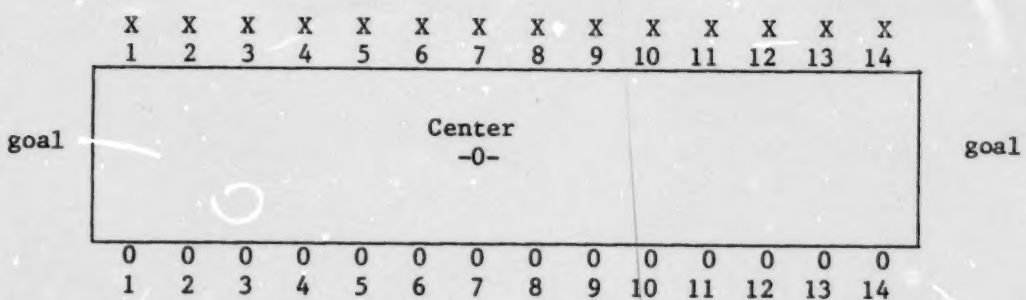
The basic rules for a line game follow:

1. Have two teams with an equal number of players on each team.

2. Give each player on the team a number that must be remembered. For example, if there are seven members on a team give each player a number from 1-7.

3. Establish boundaries; use a square or rectangle-shaped boundary.

4. Each team lines up along side of the playing area.



As can be seen from the diagram there are 14 players on each team. The number below the 0 or X is the number that players must remember.

5. Call out one or two numbers. Those students with those numbers run to the center for a face off and play begins.

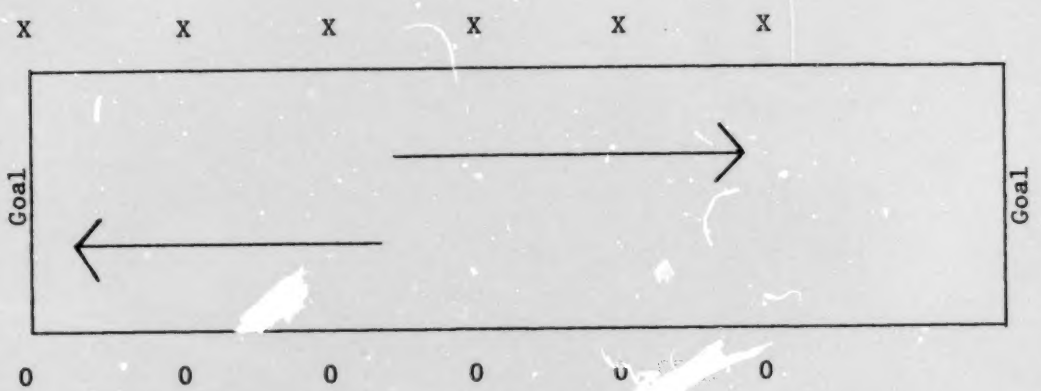
6. Play continues until a goal is scored.

7. For more activity call out 4 or 5 numbers at once or all the numbers.

Line Soccer

Soccer is an excellent team activity for the mentally retarded. Kicking a ball is fun and reinforcing to most mentally retarded students. Every player can have contact with the ball. At its simplest skill level little coordination of upper body (arms and hands) and lower body (legs and feet) is necessary. The fast pace of line soccer keeps the student's attention. The strenuous physical activity gives the students maximum exercise in a minimum time period.

The game starts with the two teams numbered off and standing on opposite sidelines. Numbers are called and those players run out and face off at the center.



1. The X team would score by any ball rolling over the line on the right of the page.

2. The 0 team would score with any ball passing over the goal at the left.

3. Players on the sideline whose number hasn't been called can kick any ball that comes over the sideline area back to a teammate playing on the floor.

4. The game continues until a goal is scored and then new numbers are called.

5. If the players tire before a goal is scored call new numbers. Watch for fatigue exhibited by those players on the floor.

Teaching Suggestions

1. Make sure the players know their number and which way their goal is.
2. Players can choose a goalie if they desire. The goalie can catch or stop the ball with the hands and throw or kick it to a teammate.
3. As the students become more skilled the goal area can be shortened or a cage set up or a small goal area painted in.
4. For more activity try using two soccer balls at a time.
5. If any player touches the ball with the hand the other team gets a free kick.
6. Penalize students who are rough, trip, or play unfair.
7. Score can be kept for students who understand.
8. The soccer ball can be slightly deflated as a safety factor.

Line Floor Hockey

This game is basically the same as line soccer except that plastic hockey sticks and a plastic puck are used. This game can also be played on roller skates for more adept students.

Teaching Suggestions

1. Safety is important here as the sticks can injure another student if improperly used. Make a rule that two hands must be kept on the stick at all times and the stick cannot be raised above shoulder level when trying to hit the puck.
2. To increase skill levels, puck handling and shooting drills can be introduced before the first line floor hockey games take place.
3. Two pucks can be used at once to increase activity.
4. If the players have trouble hitting the puck, use a rubber playground ball or wiffle ball.
5. As skill levels increase, goal areas can be shortened.
6. If no hockey sticks or pucks can be found, the game concept can be used with brooms and small playground balls.

Line Basketball

Same line concept. Only players on the floor compete until a team scores a basket; then new numbers are called and new players begin play.

Teaching Suggestions

1. Colored jerseys may be used to identify different team members.

2. Go easy on calling double dribble and walking. Let the students play and have fun.

3. A lower basket and a smaller ball might make the game more successful for smaller and less-talented players.

4. Two basketballs can be used to speed activity.

5. Free throws can be shot for fouls, or the ball given out-of-bounds.

The line games should be developed around the skill level of the group and modified if needed to meet individual needs. The retarded need to be given easily understandable game concepts, and skill instruction. When the teacher's demonstration of a skill is not comprehended they may have to be manually taken through the movement.

Team sports, including the line games, develop physical fitness. These team sports provide successful experiences in social as well as motor skills. The important thing to remember is to modify the games, if need be, to suit particular situations and student needs.

ACTIVITIES FOR ELEMENTARY MODERATELY RETARDED STUDENTS

For the younger students and those individuals who cannot participate with success in more complex games a variety of simple activities which will achieve the goal of desired physical development can be used.

With younger students there are endless opportunities for big muscle activity in mimetic play. The students can pretend they are cars, trains, airplanes, animals, flowers, etc. and move as they conceive such objects would move. These activities may be done to music for added interest.

The teacher may want to start each class with a short exercise or warm-up period. Three to five minutes of exercises may be adequate. Students should have plenty of space to exercise. Chalk marks or masking tape may be used to give each student a definite working area.

The exercises may be performed with or without music. The right music can however, add to the effectiveness of the exercises. Quickly move from one exercise to another. Moving rapidly keeps the child's attention and may gain their interest to find out what to do next.

Exercises can include going from a standing to a lying position and back up again, rotating the arms, jumping and reaching high, jumping around in circles, push-ups, sit-ups, running in place, touching toes, and jumping jacks.

Hula hoops are good for vigorous activities with the younger students. Some activities might include: racing rolling the hoops; jumping in an out of the hoop; running around the hoop; rotating the hoop around the neck, waist, or legs; throwing bean bags into the hoop; running with the hoop held over head.

Another game that works well with the students, especially those who understand the concept of chasing and catching one another is a game called flag football tag. Each student is given a flag football belt with the velco tear away streamers. One student should be in the middle and the other students lined up a long a wall or line. At the sound of a whistle or command the students must run to the other side or boundary. Once across to the other side, they are safe. The student in the middle attempts to catch (by tearing off the flag) as many students as possible. Those caught are also in the middle. On command or whistle try to catch those students left who must run through to the other side. Game continues until the last one is caught. The student is then in the middle to start a new game.

This is a great fitness activity and can be very tiring if the students are competitive or like to chase or be chased. Watch for fatigue.

1. May have to keep the boundaries small. As the students learn the game the boundaries can be expanded.

2. May have to manually pull or push some of the less active students.

3. Can reward the last student caught to increase competition.

4. Safety is important. Keep boundaries from walls or doors.

DANCE

The mentally retarded enjoy music and respond well to dance and rhythmic activities. Dance can be enjoyed by students who are crippled, blind, those in wheelchairs, and by students who find greater reward in individual and dual activities than in team play.

Dance is an important part of physical education. Dance can contribute to the physical development of the child through: improved endurance; increased muscle tone and flexibility; better coordination and balance; an expanded movement vocabulary.

The dance teacher will assure success by breaking the parts of a dance down to a level commensurate with the skill of the student. A dance for the students might involve nothing more than following the instructor in the execution of simple rhythmic activities. The nature of the dance experiences provided should depend upon the child's ability level.

The teacher might want to begin a dance unit by having the students explore how to move their bodies. They can explore ways to twist, bend, stretch, and ways that the arms and legs move. From this the students can progress to moving the body through space and relating to other bodies moving through space. Often props such as a parachute or plastic sheets can be used to encourage movement.

Once the students begin to build their own movement vocabularies, they can begin to create their own movements for expressing themselves. Music is a great motivator for encouraging movement and for getting lazy students moving.

After the introduction of the students to movement and dance, the teacher may want to plan out a few three- or four-week dance units in areas of interest such as square, aerobic, or modern dance. If possible the students can bring their own favorite music for the class. The teacher can gradually add other music to expand the range.

Teaching Suggestions

1. The teacher of dance should have enthusiasm and a high energy level.

2. Guest dancers or volunteers can be brought in who can demonstrate different dances. Local dancing schools or college students majoring in dance can be helpful.

3. Repetition is a key factor to dance success.

4. Having the students mirror the teacher's movements is one of the easiest ways to begin learning a dance.

5. Working in circles or single file avoids collisions.

6. After the students can imitate movements, place them in imaginary situations so they can improvise movement and dance.

7. Break the class down into different periods such as 10-15 minutes for warming up, 20 minutes of core activity, 10 minutes for review, and 5-10 minutes for warming down.

8. Jacki Sorensen and Bill Bruns have written a book, Aerobic Dancing.[19] Some of the concepts covered include: how aerobic dancing works; physical benefits of aerobic dancing; heart rate monitoring; measuring progress; a 12-week dance program.

   The book has more than 160 illustrations and detailed instructions on warm-ups, the basic forms of aerobic dancing, and concluding exercises.

SWIMMING FOR AEROBIC FITNESS

Swimming is one of the best physical activities for people of all ages and for many people who are handicapped. Vigorous water activities can make a major contribution to the flexibility, strength, and cardiovascular endurance of individuals. With the body submerged in water, blood circulation automatically increases to some extent, promoting deeper ventilation of the lungs and increased heart rate.

Dr. P. O. Astrand, the noted Swedish physician and exercise physiologist, studied young girls who were training very intensely for swimming competition. He found that they have larger hearts and higher vital capacities and maximum oxygen uptakes than more sedentary girls of the same age and

size. It seems that early athletic training, particularly in swimming, can favorably influence lifelong exercise capacity if begun during adolescence.[20]

Physical education swimming classes provide a unique opportunity to improve and maintain physical fitness. Historically, swimming classes have taught people to swim safely and skillfully, and this should always be the first consideration; once students can swim safely, fitness techniques can be incorporated into the swimming program.

Some possible aerobic activities that can be incorporated into the swimming program with the moderately retarded might include the following:

1. Kicking. The student can hold onto the side of the pool and kick. The teacher might use the following sequence:

   Kick for 30 seconds

   Rest for 30 seconds

   Kick for a minute

   Rest for 30 seconds

   Kick for a minute

   Rest one minute

   Repeat

   Kicking, if done vigorously can be very tiring. It is better to have short periods of kicking, followed by rest, than one or two long periods.

2. Distance swimming for endurance. It takes roughly as much energy to swim 440 yards freestyle as to run a mile.[21]

   Students can swim laps for rewards. Awards can be given out for distance covered, 2-mile club, 5-mile club, etc. Students who have trouble swimming a freestyle or other stroke can swim laps with the aid of a flutter board.

3. Relay races. For students who can't swim relay races can be done in the shallow end of the pool with the students walking through knee- or waist-deep water.

4. Walking in water. Walking in knee- or waist-deep water is an excellent way to build aerobic fitness. Exercise, including walking, performed in the water is frequently used in the initial stages of cardiac rehabilitation programs. A recent study stated:

   > ...water resistance makes movement through waist deep water by walking or jogging more strenuous than comparable exercise in air. Relatively high levels of respiration, circulation, and

oxulative metabolism are required to move through the water at slow speeds. Furthermore, the buoyant effect of water greatly reduces the weight bearing stress on muscles and joints. This information suggests that walking and jogging in water can be a valuable mode of conditioning for developing or maintaining physical work capacity and cardiovascular fitness, particularly for individuals with joint problems.[22]

5. Aqua-dynamic conditioning. This consists of sequences of exercise that can be performed in water approximately shoulder-deep. The exercises are presented in a way that provides for a change of pace. That is, a stressing and easing-off of strenuous exercise to less vigorous ones to permit recovery periods. Following a period of warmup activities out of the water, a series of exercises lasting from 15-60 minutes, depending on the degree of difficulty selected, can be performed in the pool.[23]

A FINAL THOUGHT

Studies have shown that a well-planned vigorous fitness program can have positive effects on the mentally retarded population. The teacher must be concerned with the individual needs and exercise tolerance of each student.

To enchance the aerobic fitness program it is important to pre-plan effectively by: arranging class according to ability (if possible); getting maximum use out of the time permitted for fitness; providing facilities and equipment that will stimulate interest and increase the capabilities of developing fitness; developing motivational strategies which will increase positive attitudes toward fitness; designing and modifying games and activities that will allow each individual to attain a maximum level of fitness.

FOOTNOTES

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[22]Evans, Blanche W.; Cureton, Kirk J.; and Purvis, Jamie W. "Metabolic and Circulatory Responses to Walking and Jogging in Water." Research Quarterly 49, No. 4:442-449.

[23]"Youth Physical Fitness." President Council on Physical Fitness and Sports. Washington, DC: U.S. Government Printing Office, July, 1976, p. 60.

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PURPOSES OF THE AMERICAN ALLIANCE FOR HEALTH, PHYSICAL EDUCATION, RECREATION AND DANCE

The American Alliance is an educational organization, structured for the purposes of supporting, encouraging, and providing assistance to member groups and their personnel throughout the nation as they seek to initiate, develop, and conduct programs in health, leisure, and movement-related activities for the enrichment of human life.

Alliance objectives include:

1. Professional growth and development--to support, encourage, and provide guidance in the development and conduct of programs in health, leisure, and movement-related activities which are based on the needs, interests, and inherent capacities of the individual in today's society.

2. Communication--to facilitate public and professional understanding and appreciation of the importance and value of health, leisure, and movement-related activities as they contribute toward human well-being.

3. Research--to encourage and facilitate research which will enrich the depth and scope of health, leisure, and movement-related activities; and to disseminate the findings to the profession and other interested and concerned publics.

4. Standards and guidelines--to further the continuous development and evaluation of standards within the profession for personnel and programs in health, leisure, and movement-related activities.

5. Public affairs--to coordinate and administer a planned program of professional, public, and governmental relations that will improve education in areas of health, leisure, and movement-related activities.

6. To conduct such other activities as shall be approved by the Board of Governors and the Alliance Assembly, provided that the Alliance shall not engage in any activity which would be inconsistent with the status of an educational and charitable organization as defined in Section 501(c) (3) of the Internal Revenue Code of 1954 or any successor provision thereto, and none of the said purposes shall at any time be deemed or construed to be purposes other than the public benefit purposes and objectives consistent with such educational and charitable status.

Bylaws, Article III